REMARKS

Claims 1–19 are pending, of which Claims 1, 8, and 17 are independent. Claims 1–19 stand rejected. Applicants respectfully traverse the rejections and request reconsideration.

35 U.S.C. §102 Rejections

Claims 1 and 6 stand rejected under 35 U.S.C. §102(e) as being anticipated by Hoof, U.S. Pat. No. 7,203,193 (hereinafter "Hoof"). Applicants respectfully disagree for the reasons set forth below.

Applicants' Claim 1 recites, in part, "*a switch fabric coupling [] input queues and [] output queues, ...said switch fabric storing cells based on said output queues.*"

Hoof is generally focused on transmitting notification messages to an egress control unit ("ECU") without causing burst-overload of messages to be processed by the ECU by holding messages to be sent and distributing the messages evenly. *See* Hoof, col. 1, line 63 to col. 2, line 4.

Hoof's method for transmitting a packet from the ICUs to the ECUs involves multiple distinct steps. First, "[u]pon receipt of a packet by an ICU, the ICU forwards the packet to a PBU via [the PBU's] dedicated link for storing." Hoof, col. 3, lines 57–58. Second, the "PBU stores the packet in [data] memory." Hoof, col 3, lines 58–59. Third, the PBU "transmits a notification to all ECUs that may be interested in receiving the packet." Hoof, col. 3, lines 59–61. Last, "[i]f a receiving ECU has enough space in its appropriate queue...[the ECU] transmits an indication to the PBU, referred to as a booking message." Hoof, col. 3, lines 61–65. Hoof's booking messages indicate that "the address [of the packet] has been queued for causing the PBU to keep the packet in memory until [the ECU requests the packet]." Hoof, col. 3, lines 64–67.

Each of the PBUs and ECUs include a mechanism for storing notification messages separately from packets; namely, the PBUs include notification queues, and the ECUs include egress notification queues. *See* Hoof, col. 2, lines 36–52 and col. 6, lines 4–14. Hoof describes these queues separately from the PBU's data memory, which stores the packets, because any requests for packets from the ECU to the PBU does not affect the PBU's storage of the packets, but separately stores a reference associated with the packets, *e.g.*, the packet's address in the

PBU's data memory, for later retrieval. In other words, Hoof's storing of packets in the PBU is not based on the ECUs; conversely, only notification messages to and from the PBUs are stored based on the ECUs. *See* Hoof, col. 6, lines 4–14. Hoof's ECUs merely transmit a request to the PBUs "indicating that the packet reference was enqueued [in the ECU's egress notification queues], and the associated packet is to be maintained in the PBU's data memory;" however, this request is not the basis for how the PBUs store the packets, but is merely a notification not to forward the packets. *See* Hoof, col. 6, lines 15–19. The request is not representative of a state of an output queue upon which a switch fabric stores cells (*i.e.*, "*said switch fabric storing cells based on said output queues*," as recited in Applicants' Claim 1).

For example, Hoof's ICUs 10 send packets to the input controller 50, which forwards the packets to the memory manager 44 for storing the packets in the PBU's data memory 40. *See* Hoof, col. 5, lines 11–13. The controller 50, after storing the packet in the PBUs' data memory 40, transmits notification messages to the ECUs "indicating that a packet in which an ECU may be interested in has been received and stored in the data memory." Hoof, col. 5, lines 22–26. Later, the controller 50 can retrieve packets stored in the data memory and forward the packets to ECUs 12 upon a message sent from the ECUs to the PBUs. *See* Hoof, col. 5, lines 26–28.

As can be understood from the example above, Hoof's PBUs merely send messages to the ECUs informing the ECUs that a packet has been stored in the transmitting PBU's data memory. The "notification" should be understood as nothing more than the ECUs being put on notice of the stored packet, and, in response, the ECU must perform an action to retrieve the stored packet. In other words, the packets will remain in the PBUs' data memory, with no association to any ECUs, unless the ECUs request an association via a booking message sent in response to a notification message. For example, if no ECUs have space available in their queues, the packet will remain in the PBU data memory 40, without any connection whatsoever to any ECU. Therefore, Hoof does not disclose every element of Applicants' Claim 1 ("*a switch fabric coupling [] input queues and [] output queues, ...said switch fabric storing cells based on said output queues*").

Furthermore, the Office states, on page 2 of the Advisory Action, that Hoof's PBUs store "the packet for a certain period of time based on when Hoof's ECU sends a booking message to release the packet from the [PBU's] memory (*citing* Hoof, col. 3, lines 63–67)....[t]hus the

packet is stored for a length of time based on the [ECU] queue." This statement fails to recognize that a packet stored in the PBU's memory is stored there no matter the action or inaction of the ECU. In other words, Hoof describes its booking messages as a request "that the packets are to be maintained in memory until requested by the ECUs." Hoof, col. 5 (emphasis added).

Therefore, Applicants respectfully submit that Hoof, which stores notification messages based on the ECUs and does not store packets based on the ECUs, fails to teach or suggest "*a switch fabric coupling [] input queues and [] output queues, ...said switch fabric storing cells based on said output queues*," as recited in Applicants' Claim 1.

Since Hoof does not disclose all the elements of Claim 1, Applicants respectfully submit that the rejection of Claim 1 under 35 U.S.C. §102(e) is improper and should be withdrawn. Dependent Claim 6 inherits the foregoing patentably distinguishable elements of Claim 1 and should be allowed for at least the same reasons presented above in reference to Claim 1.

35 U.S.C. §103(a) Rejections

Claims 2, 3, 8, 9, 11, 12, and 17–19

Claims 2, 3, 8, 9, 11, 12, and 17–19 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Hoof in view of Chao *et al.*, "Delay-Bound Guarantee in Combined Input-Output Buffered Switches" (hereinafter "Chao"). Applicants respectfully disagree for the reasons set forth below.

Claims 8, 9, 11, 12, and 17–19

Applicants' Claim 8 recites, "*a controller...prioritizing arriving cells in said input queues based on times of said arriving cells to depart, and updating cells in said input queues available for transfer to said switch fabric.*"

The Office Action, at page 5, states that Hoof "does not specifically disclose the controller ordering cells in the switch fabric based on times in of [sic.] cells to depart, wherein cells with lower times of [sic.] cells to depart have higher output priorities (emphasis added)." The Office cites Chao for Hoof's failures.

Applicants respectfully note, however, that Applicants' Claim 8 does not recite the aforementioned elements; in actuality, Claim 8 recites, in pertinent part, "*prioritizing arriving cells in the input queues* (emphasis added)," and not in the switch fabric as stated by the Office. As such, Applicants respectfully request the Office clarify its argument and distinctly point to a portion of Hoof or Chao as being said to disclose "*prioritizing arriving cells in the input queues*," as recited in Applicants' Claim 8.

However, notwithstanding the foregoing, Applicants continue to argue that the Office's proposed combination of Hoof and Chao fails to teach each and every element of Applicants' Claim 8. Specifically, Chao, alone or in combination with Hoof, fails to disclose "*prioritizing arriving cells in the input queues*," as recited in Applicants' Claim 8.

On page 5 of the Office Action, the Office states that Chao is said to disclose "the fabric orders the transmission of cells to the output queues by virtual finishing time and cells with the smallest virtual finishing time have the highest priority," citing to Chao, pg. 517, Step 3. Applicants agree with the Office that Chao's switch fabric orders transmission of the cells; specifically, Applicants note the cited section of Chao discloses the "server of input I_i...performs a WF^2Q scheme by selecting an eligible packet." As illustrated in Chao's Fig. 1, the server of input I_i is located on the non-blocking switch; thus, Chao selects packets at the switch fabric and does not "*prioritiz[e] arriving cells in the input queues*," as recited in Applicants' Claim 8 (emphasis added).

Moreover, Applicants respectfully submit that Chao cannot be combined with Hoof because it would cause Hoof to be unsatisfactory for its intended purpose. *See* MPEP 2143.01(V).

Chao's principle of operation is centered around fixed-length switching to achieve high switching efficiency by segmenting packets into fixed-sized cells. *See* Chao, page 515, §I. Chao discloses a device containing non-blocking switches that perform a Switch Hierarchical Link Sharing (SHLS) scheme by following a specific four-step method.

First, an input controller (IPC), which controls the input queues, selects a packet with the smallest finishing time (the IPC sends a request for this packet to its corresponding output port). *See* Chao, p. 517 and 519–520. Second, the output arbitration controller (OAP), which controls the output ports, selects an eligible packet from the IPC with the smallest virtual finishing time

(the OAP sends a request for this packet to its corresponding input port). Third, the input arbitration controller (IAP) selects an eligible packet from the OAP with the smallest virtual finishing time. During step three, the IAP transmits the packet from the virtual output queue on the inputs to its corresponding output buffer. Last, once a cell is transmitted across the switch, the cell is stored in the output buffer until the entire packet is reassembled. *See* Chao, pp. 517–521.

In other words, Chao forwards packets directly from the input queues to the output buffer and only transmits the cells across the switch to be stored in the output buffer. Chao specifically stores the cells in the output buffer, and not in the switch fabric, because Chao segments packets into fixed-sized cells, and, therefore, the fixed-sized cells must be reassembled into packets upon all cells reaching the output buffer. Because there is no storage described in the non-blocking switch, the transferred cells cannot be reassembled at the switch.

Hoof is as argued above in reference to Claim 1; namely, forwarding packets from an ICU to a PBU, storing packets in the data memory of the PBU, sending and receiving notification messages to and from an ECU, and forwarding packets to the ECU upon request. Hoof's principle of operation is further directed to synchronizing notification messages transmitted from a PBU to an ECU (and vice versa), so as to allow for even distribution of messages and packets stored in the PBU. *See* Hoof, Abstract.

Thus, if Hoof were combined with Chao as suggested by the Office, Hoof would be unsatisfactory for its intended purpose. For example, if Hoof's PBU were merely to transfer a packet directly from an ICU to an ECU (as in Chao) without first sending a notification message to an ECU inquiring whether the ECU wants the packet, then the ECU's appropriate queue may not have enough space and the packet would be rejected or dropped completely, thereby losing data. The Office's proposed combination would cause Hoof's ECUs to receive packets directly forwarded from the inputs, resulting in burst-overload.

In addition, for such a combination to exist, Hoof would have to be substantially modified to remove completely the PBU from the switch fabric because Chao requires direct transmission of packets from an input port to an output buffer without any intermediate storage, as opposed to Hoof's intermediate storage in the data memory of PBUs, including in the switch fabric. Such a modification of Hoof requires substantial reconstruction and redesign, as well as

changes in the basic principle under which the Hoof construction was designated to operate, as described above. *See* MPEP 2143.01(VI), *citing In re Ratti*, 270 F.2d at 813. Thus, because the proposed combination would change Hoof's principle of operation, Applicants respectfully submit that the Office has failed to establish a *prima facie* case of obviousness.

In view of the foregoing arguments, Applicants respectfully submit that Claim 8 is novel and non-obvious over Hoof, alone or in combination with Chao. Claims 9, 11, and 12 depend from independent Claim 8, include the same elements as the independent claim from which they depend, and are believed to be novel and non-obvious for at least the same reasons as presented above. Independent Claim 17 includes similar elements as Claims 1 and 8 and is novel and non-obvious for the same reasons presented above in reference to Claims 1 and 8. Claims 18 and 19 depend from independent Claims 17, include the same elements as the independent claim from which they depend, and are believed to be novel and non-obvious for at least the same reasons as presented above. As such, Applicants respectfully request withdrawal of the rejections of Claims 8, 9, 11, 12, and 17–19 under 35 U.S.C. §103(a) and acceptance of same.

Claims 2 and 3

Claims 2 and 3 depend from Claim 1 and include the same elements of the claim from which they depend; thus, Applicants respectfully submit that dependent Claims 2 and 3 are novel and non-obvious for at least the reasons set forth above in reference to Claim 1 and further in view of the foregoing remarks regarding the combination of Hoof in view of Chao. As such, Applicants respectfully request withdrawal of the rejection of Claims 2 and 3 under 35 U.S.C. §103(a) and acceptance of same.

Claims 4, 5, and 7

Claims 4, 5, and 7 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Hoof in view of Chuang *et al.*, "Matching Output Queuing with a Combined Input/Output-Queued Switch" (hereinafter "Chuang"). Applicants respectfully disagree.

Chuang, which is directed to a combined input/output queued switch, was introduced as a secondary reference against Claim 4 only due to a deficiency of Hoof regarding "determining an incoming cell's priority based on the time of the cell departing from an output queue and the

times of other cells in the output queue to depart." Office Action, page 9, lines 6–8. Chuang was only introduced against Claim 5 regarding lowest time-to-leave scheduling, lowest time-to-leave blocking, and non-negative slackness insertion. Chuang was only introduced against Claim 7 for emulation of an output queued packet switch. Chuang does not cure the deficiency of Hoof regarding Claim 1, from which Claims 4, 5, and 7 depend, as described above ("*switch fabric storing cells based on [the] output queues*"). Therefore, Applicants respectfully submit that the rejection of Claims 4, 5, and 7 under 35 U.S.C. §103(a) is improper and should be withdrawn.

Claim 10

Claim 10 stands rejected under 35 U.S.C. §103(a) as being unpatentable over Hoof in view of Chao and further in view of Chuang. Similar arguments apply for Claim 10 as for Claim 4, described above. As such, Applicants respectfully submit that Claim 10 is novel and non-obvious over the cited combination of art and the rejection under 35 U.S.C. §103(a) should be withdrawn.

Claims 13 and 14

Claims 13 and 14 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Hoof in view of Chao and further in view of Rojas-Cessa *et al.*, "CIXB-1: Combined Input-One-Cell Crosspoint Buffered Switch" (hereinafter "Rojas-Cessa"). Applicants respectfully disagree

Rojas-Cessa, which was introduced as a reference against Claim 13 only for multiple virtual output queues, does not cure the deficiencies of Hoof and Chao regarding Claim 8, from which Claim 13 depends. Therefore, Applicants respectfully submit that the rejection of Claims 13 and 14 (depending from 13) under 35 U.S.C. §103(a) is improper and should be withdrawn.

Claims 15 and 16

Claims 15 and 16 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Hoof in view of Chao and further in view of Zhang, "Service Disciplines for Guaranteed Performance Service in Packet-Switching Networks" (hereinafter "Zhang"). Applicants respectfully disagree.

Zhang was introduced as a reference against these claims only for FIFO groups (Claim 15) and a plurality of crosspoint schedulers (Claim 16). Zhang does not cure the deficiencies of Hoof and Chao regarding Claim 8, from which Claim 15 depends. Therefore, Applicants respectfully submit that the rejection of Claims 15 and 16 (depending from 15) under 35 U.S.C. §103(a) is improper and should be withdrawn.

Supplemental Information Disclosure Statement

A Supplemental Information Disclosure Statement (SIDS) is being filed concurrently herewith Entry of the SIDS is respectfully requested.

CONCLUSION

In view of the above remarks, it is believed that all claims, Claims 1–19, are in condition for allowance, and it is respectfully requested that the application be passed to issue. If the Examiner feels that a telephone conference would expedite prosecution of this case, the Examiner is invited to call the undersigned.

Respectfully submitted,

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